

ABSTRACT

Ethanol is produced from biomass by the process of a heated aqueous solution containing 20 to 40 percent alkali metal hydroxide to break the lignin-cellulose bond. Then the biomass is heated further to remove carbon dioxide from the cellulose and lignin to produce a mixture of carbohydrates, modified sodium lignin, micro-cellulose, lignin-cellulose resinous products and sodium carbonate. Water is added to the mixture and most of the mixture is water soluble. An acidic salt forming compound is added to the aqueous solution until a pH of 3-7 is obtained. The lignin is precipitated. The lignin-cellulose resinous products float to the top and is skimmed off. The solution containing the carbohydrates and salt is decanted off the lignin and is concentrated by evaporating off water. The carbohydrates crystalizes from the solution and the water and salt is filtered off. Water is added to the carbohydrates then it is fermented to form ethanol. The ethanol is recovered from the water by evaporation.

The water, sodium hydroxide and calcium oxide are recovered for reuse and the lignin may be burned to furnish heat for the process. The reaction of the sodium hydroxide with the biomass is exothermic and furnishes heat for this process and heat is captured by a heat exchanger.